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Patent Portable Gas Works.

When we take into consideration the large proportion of our lives which would be passed in darkness were it not for artificial light, it is not unnatural to the searcher for more light to examine with interest the different improvements for manufacturing illuminating gas which may be presented to the public from time to time. Man is constantly seeking for greater convenience and economy in all the domestic arrangements which are the most essential to comfort, and the nearer this convenience approaches to a luxury the greater the satisfaction. The ancient "rush light" and "tallow dips" of a later period have passed away, and are superseded by the more useful and convenient lamp. But even this does not meet the desires of the country people, after having enjoyed the luxury of gas light in town, and at once invention sets at work to produce a portable gas light to accommodate those who do not live in towns and cities and pay heavy taxes.

The Archer, Pancoast & Co.'s Portable Gas Works are of this nature, whereby oils, grease, crude petroleum, etc., is converted into gas. The engraving and description herewith, will give a clear idea of its construction and operation

The oil is conveyed from the reservoir (K) through pipe (T) to retort (R) passing through it into retort (e), and is thoroughly decomposed by the action of heat in the furnace (A).

The gas, now made, passes through pipe (S), submerged in cooling trough (B), into wash box (C), where it is thoroughly purified and washed by water, and passed through pipe (M) into gasholder (G).

A continual stream of water, supplied from reservoir (I), passes through cooling and condensing trough (B) and pipe (O), into wash box (C), and runs off through syphon box (D), carrying with it all impurities washed from the gas.

The gas now made, that is stored in the gasholder, is too rich, and in its passage to the service pipe (X) is conveyed through mixer and meter (F), where its volume is doubled by the admixture of air.

The apparatus is called Deavs Patent. The following advantages are claimed for this invention: First, safety, inasmuch as the gas is manufactured by a similar process to ordinary coal gas (viz., destructive distillation) while it possesses a much higher illuminating power, and costs much less to manufacture. Second, cheapness—the material used being crude petroleum, petroleum tar, or paraffine oil, which is considered to be inexhaustible and always cheap in market. The works are simple and moderately cheap in construction, and require little skill to operate, consisting of a retort

ARCHER, PANCOAST & CO.'S PORTABLE GAS MACHINE.

washing purifier or condenser, gasometer and meter, as previously explained by the engraving.

These works can be furnished of any size required, but are more especially designed for lighting private dwellings or small towns. The gas can be made daily, weekly, or monthly, depending upon the capacity of the gas holder. This apparatus is being introduced extensively throughout the country. Among other places it was introduced a year ago in the Stetson House, the United States and Continental Hotels at Long Branch, and gives excellent satisfaction we are told, while in the West it is becoming quite popular.

For further information, address Archer, Pancoast & Co., 13 Mercer st., N. Y., or C, E. Gray, Cleveland, O.

Practical Management of Gas Works.

BY JAMES R. SMEDBERG.

[WRITTEN EXPRESSLY FOR THIS JOURNAL.]

NUMBER SEVEN.

The pen *is* "exchanged for the charging-scoop"; but these articles have gradually become a labor of love and it is my intention to fulfil my pledges in regard to their completion, as well as to the compilation of the "Synopsis of British Gas Lighting." If I do lose the advantage of daily courtesies from the Manhattan Gas Company's officers and employés, I am, while pursuing new and more congenial duties, brought into even closer contact with all the essential points of practice than is possible to any editor at all

To those who have given me words of cheer I return my very sincere thanks; while I like to think that the silence of many others is "golden" with some reciprocation of the kindly wishes which I entertain for all my co-workers in gas processes.

The list of Manhattan labor is, of course, intended to comprise only *one* watch.

And now, I confess myself unfamiliar with any points of bench management which have not been noticed by me in the first six articles of this series. Omissions there very probably are; but my correspondence with the more distinguished engineers of the country has been very circumscribed, and it is to this fact that any omissions are attributable—not to want of faithful study and honesty of purpose upon my part.

We are all aware how enormous was the back pressure upon the retorts in the rather bad old days when wet-lime purifiers were used, and the exhauster had not been devised. Clegg mentions eight inches of seal as common enough in each wet-lime purifier; and I remember seeing it stated in some old number of the *London Journal of Gas-Lighting* that 37 inches pressure *upon the hydraulic main* was then quite usual. Hence arose the propriety of using a hydraulic main of very large cross-section, and of constructing the dip-pipe and back riser of the bridge-pipe of sufficient aggregate length to afford a height of five feet above the tar-level.

But since the exhauster has relieved the main of its pressure, the necessity of running the bridge-pipe away up toward heaven has not existed.

Twenty-four inches height is ample. If the driving belt of the exhauster break, the self-acting by-pass is instantly swept open by the flow of gas from the retorts, and we have, *at the outside*, a column of 10 inches of tar flung up each dip-pipe which is unconnected with a working retort. This remark does not contemplate the very few American works in which wet-lime is used.

While I shall probably employ some form or other of hydraulic main in which the dip-pipes are so inserted as to leave an unobstructed gas-way, I am led to do so more by the practical motive of saving metal than by any idea that an *important* reduction of pressure can be effected by it.

It will be noticed that the last paragraphs of the sixth article directly conflict with the remarks in the first upon the utility of tie-blocks. Further than this, in speaking of the square reveal I wrote with such inaccuracy (Am. G. L. J., vol. ix, p. 196,) as to render me desirous of substituting the following sentence for the one as published:

> It is an improvement to adopt a square reveal for the reception of the facing wall, instead of the old form of a circular arc turned with a radius 4½ inches greater than that of the interior face of the bench, as the square reveal does away with much of the cutttng and shaping of the brick, which was formerly necessary in carrying up the facing. Of course, where the advice is followed of making the facing wall a full brick in thickness this reveal should be nine inches in depth—the projection being protected and supported by a cast iron bar of 9 x 1-inch metal, and of sufficient length to lap about three inches on each of the intermediate piers.

These two blunders arose from the fact that this same first article was written eight years ago, and was hurriedly republished without revision.

CONCERNING COALS.—It had been my intention to publish a classified list of experiments upon some fifty or sixty of the very best American, Provincial, and British gas coals; but have decided not to do so in the body of my articles by the almost certain jealousy, wrangling and debate which any report of a brevity suited to my purpose would cause. I would, nevertheless, state that all reports of coal analyses which may be sent to my San Francisco address by the coal producers of the country, will be published as supplements to these articles, *providing* the names of the persons making the tests, and the date and place of trial are attached to each report communicated.

SUPPLEMENT TO THE PRACTICAL MANAGEMENT OF GAS WORKS

REMOVAL OF CARBON FROM RETORTS.

Sir: Much inconvenience at times arises in gas works from the accumulation of carbon in clay retorts, and the stopping up of the stand-pipes. I myself suffered from this cause last winter, and was induced to devise a plan, which I believe has not yet been adopted in England, for cleaning out the retorts and pipes; and, as it has been completely successful, a description of the method will, I think, be of some interest to your readers.

My retorts are of clay, 17 feet 6 inches long, and have a mouth-piece at each end. As soon as the deposit begins to be troublesome, I put into one of the mouth-pieces of the retort a wrought iron pan (shaped to the form of the retort) 18 inches long and 6 inches deep, filled with water. Both retort-lids are then put loosely on, and the cover of the stand-pipe at the end of the retort opposite to that in which the pan is placed is taken off. The open stand-pipe acts as a chimney and draws the steam which is generated along the retort. The steam is decomposed by contact with the graphite, and in about twenty-four hours the latter can be loosened and removed with facility. The tar, etc., in the stand-pipe will also be completely burned out.

GEORGE HOWITZ.

Gas-Works, Copenhagen, Dec. 14, 1859.

The Immersed Multitubular Condenser.

[Mr. SMEDBERG's hurried departure from our city renders it necessary to fill his usual space with the following description of the noble condenser to which he was the first, eight years ago, to assign a name.—EDS.]

The inlet to the condenser is an 18-inch pipe, while the condensing series is composed of 240 4-inch pipes, each 11 feet 6 inches long, rising vertically from the lower sealing-box through the water contained in the tank of immersion. Considering each set of 24 pipes as a single multitubular duct, we find 10 of these ducts joined in alternate pairs, at top by a water-lute and cover similar to that of the dry lime purifier, and at bottom by a sealing-box with the ordinary partition plates running transversely to its length, and dipping into the tarry and ammoniacal products of condensation. The lower box is 30 ft. by 8 ins. long, by 5 ft. 3 ins. wide over all, and is provided with the usual tar-overflower, and with hand holes at proper points for cleansing. The top plate of the lower box is 1¼ inches thick, and forms the bottom of the water-tank, the sides of which, suitably decorated with exterior mouldings, are bolted to the lower box, and thus completely surround the lower vertical sides. At one end of the tank is a pipe for the admission of the cool water, and, at the other end, a similar pipe for the eduction of the water after it shall have absorbed the excess of heat from the gas, and so have reduced it to its required temperature.

It will be observed that, owing to the manner in which the small ducts are connected at top, by simply removing the covers they are all exposed and rendered accessible for cleansing.

The gas, entering the lower box is immediately separated into 24 small columns, each of which is surrounded by water, and in this minutely divided state it traverses the condenser, losing heat steadily, and sending out, be it winter or summer, an unvarying stream of condensed products through the tar-overflow.

By graduating the supply of water to the tank, and observing a thermometer placed at the outlet of the condenser, any temperature above that of the inflowing water can be preserved, and in winter, gas, so far as the condenser is concerned, can be at all times protected from the ruinous effect of a temperature, not far above, or it may be a trifle *below*, Zero.

Economy of space is also a noticeable feature of the proposed condenser, occupying only 161 square feet of ground room, yet comprising 240 four-inch tubes, each 11 ft 6 ins. long, thus affording about 3000 feet of condensing superfices. This would, if measured by the rule for atmospheric condensers, suffice for the complete condensation of 20,000 cubic feet per hour, but such a system of immersed tubes would manifestly ensure vastly increased efficiency, and when of the dimensions and arrangements given, will in practice be found to have a normal power of at least 40,000 cubic feet per hour.

In estimating the peculiar merits of the condenser, for which the caption of this article will furnish a suitable name, let engineers compare it with Wright's Ventilating Condenser, confessedly the most perfect of its kind. In this latter form of apparatus we find that at the temperature of the air its power ceases, and certain it is, even in New York, where the mercury ranges to 100° F in the shade in summer, and to 20° F. in winter, that atmosphere vicissitudes are too violent to render advisable any more 'Air' Condensers.

Even in London it is a not uncommon practice to inject steam into the condenser, with a view of raising the temperature, in connection with which practice, by the way, a lamentable accident occurred at the works of the "Equitable" Gas Company, in February, 1855.

In the case of water, however, it will be remembered that 32° F. is the lowest point consistent with its fluidity, while in summer it never approximates closely to the temperature of the air. Hence every man must admit that water, with a maximum thermal range, of say, 45° F. is far superior as a condensing material to air, which similarly varies 120° F. even without considering its vastly superior capacity for heat.

The relative effects of water and air, as cooling agents for the condensation of gas, have been determined experimentally by Peolet to be as follows:

Excess of temperature in the gas.	Quantity of heat lost by a square unit of exterior pipe surface.	
	When radiating in air.	When plunged in water.
For an excess of 10°	8	88
" " 20°	18	266
" " 30°	29	5353
" " 40°	40	8944
" " 50°	53	13437

(Clegg, 3d Edition, p. 182.)

Gas Ventilation.

It is of importance that gas should be consumed in such a manner as not to affect the atmosphere of a room at all. Several contrivances have been suggested for the purpose of effecting this.

Many years ago, when the books in the library of the Athenæum club-house were found to be impaired by the gas used in the building, Professor Faraday invented an apparatus which was found to remedy the evil. It consisted of an ordinary bat's-wing, or fish-tail burner, inclosed in a globe or bell glass, closed at the top with mica; the interior of the globe communicated with a tube, which surrounded the gas fittings, and passed away through a condensing cistern to a ventilating shaft. The tubes were so arranged as not to be visible, and the burners were suspended in the ordinary way from a chandelier. By this contrivance the gas was burnt in a closed chamber, and the products of combustion at once carried away; the great objection to it is the frequent breaking of the glasses, and the necessity for a ventilating shaft with a strong upward current. Another contrivance for effecting the same purpose consists of a ventilating bell and draught tube placed over the burner. If the bell is lowered so as to be a little below the level of the glass chimney, and the whole surrounded by a glass globe which is open only at the top, a current of atmospheric air passes down over the tube and chimney, and thence to the flame where it is consumed, after which it passes away through the draught tube. By this means the air is heated before it reaches the flame, and therefore the intensity of light is augmented: besides which, the cooling influence of the air on the draught tube and chimney prevents the heat of the gas from being communicated to the room.

Another mode of effecting ventilation, is to place a simple catch-tube or funnel over the gas, and thus to carry away the products of combustion into a neighboring chimney, or to the outside of the house. The draught-tube need not be very large, and it may be hidden above the ceiling. When this plan is not available, a less perfect mode of ventilation may be adopted

by boring a number of holes through the ceiling immediately over the chandelier or burner. The holes should be about half an inch in diameter, and they should communicate with the space above the ceiling. A few ventilating bricks should also be introduced into the wall, bounding the space on each side of the house, so as to carry off the warm air. The holes in the ceiling may be hidden from view by means of a perforated or open rosette.

Lastly, where gas can be burnt out of the room altogether, no internal combustion should be adopted. Shop windows, for example, are best lighted by means of an external jet with a reflector. On the continent this is the plan very generally employed; and it is found to produce a much more pleasing effect than when the burners are placed on the inside of the windows. There is no reason why gas may not be used in a somewhat similar way for illuminating private houses. At present we generally receive the light from the ceiling, and the combustion takes place in the atmosphere of the room; but it is quite possible to burn the gas in a closed chamber at the side of the room; say, for instance, in a recess, which might be formed by removing a portion of the wall, in some convenient situation, as between two windows. This recess might have a number of small gas-burrners with reflectors behind them; and it might be covered in front with ground glass, ornamented with some device. It should, of course, communicate with the external atmosphere, and be shut off from the room. By day it might be covered by a mirror; and at night the mirror might be slid to one side, so as to form a shutter for a window. Again, in some situations where the space between the ceiling and the upper floor is considerable, a ring of gas jets, or a sunburner, might be introduced into a closed cnamber in the ceiling, and the light might be reflected or diffused in a very agreeable manner.—Orr's *Circle of the Sciences.*

Effect of Pressure on the Consumption of Gas.

The pressure at which gas ought to be consumed is a point of considerable importance; for if the amount of pressure be high, the gas will burn with a roaring noise, and will be consumed wastefully; whereas, if it be low, the fish-tail and bat's-wing flames will not be sufficiently spread out, and the light will be dim and smoky. Dr. Letheby states, in his ninth report to the Corporation of London, that gas ought to be delivered to the public at not less than half an inch of water pressure; and it may be said that in practice, this is found to be the best pressure at which gas can be consumed.

Again, it is a matter of importance that the pressure at which gas is supplied should be as uniform as possible; for if at one time the pressure is great, and at another low, the burner requires constant attention, in order that the flame should be of one uniform height. Experiments have been made to determine the rate at which gas burns under different pressures; and as the results are somewhat important, they are tabulated below. In a general way, it may be said, that by doubling the amount of pressure, we increase the consumption of gas by about one half.

Burner.	Pressure in inches of water.	Consumption per hour in cubic feet.
Single jet.....	0.30	2.6
"	0.60	3.9
"	1.20	5 2
Small fish-tail.....	.034	1.4
" "	0.77	2.2
Large "	0.48	2.3
" "	0.97	3.3
" bat's-wing.....	0.70	3.1
" "	1.40	4.5

—Orr's *Circle of Science.*

Leaky Lamps.—Housekeepers are much annoyed at what they suppose to be leaky coal oil lamps, many persons being under the impression that kerosene will penetrate the sides of any metal lamp, and even glass itself, if not of the densest quality. This is a popular error. The oil which so persistently finds its way to the outside of lamps does not ooze through the bowl, but is caused by an overflow of the oil which ascends the wick by capillary attraction. A larger amount passes up than is consumed, and a portion trickles over on the lamp; also, when the lamp is not in use, the oil is inclined to ascend the wick, and if the tube and cap permit, it flows over. A good way to prevent this when the lamp is not in use, is to keep the wick turned down below the top of the tube as far as the wheels which keep the wick in place will admit.

For the American Gas-Light Journal.

Condensation.

BY J. R. S.

It is only of late years that condensation has occupied its proper rank among the processes of gas making. The earlier history of this branch of engineering evidences little appreciation of the necessity of complete condensing (or refrigerating) appliances—little aquiescence in the axiom, "thorough condensation is the half of purification." Proof of this strange indifference may be found in not a few gas works of over ten years' age, and even in more recent works erected under the auspices of men whose experience has been insufficient to lead to a recognition of the true mode of treatment appropriate to coal gas in its recent state.

Gas is considered to be at its standard volume at 60° Fahrenheit, and 30 inches Barometer, and yet it is fair matter for doubt whether one in twenty of our engineers considers the temperature at which it is registered, as an element in calculating his "unaccounted-for-gas." It is not the less the fact, however, that air or gases expand one four hundred and ninetieth of their bulk for the accession of every 1° above 33° Fahrenheit. If, then, one engineer has a temperature at the station meter inlet of 60°, his apparent loss will, *cæteris paribus*, be four per cent. less than that of one, the faulty construction of whose works influences a registering temperature of 80°. In the celebrated arbitration between Mr. Croll and the Great Central Gas Consumers' Company, of London, much stress was laid upon this question, and the report of proceedings thereon embodies the practical testimony of able engineers as to it. And while thus digressing it may be added, that in other details of construction and practice, this report is a very mine of information to the careful and patient reader, who may obtain it at the office of the American Gas-Light Journal.

We find in American gas works occasional instances of the multitubular condenser; of one in which the vertical pipes are flattened passages of boiler iron; and of Kirkham's Annular Condenser. Each of these aims at a large surface of condensation relatively to the cross-section of the column of gas, and the last has met with most substantial improvement at the hands of the late Alexander Wright, who, in his ventilating condenser has combined, in a degree previously unknown, perfect efficiency with ease of adjustment to the ever varying conditions of gas making. No lengthy allusion to this instrument is needed here, as a full description and drawings of the mode by which air is applied to the interior column, and caused to traverse in an opposite direction to that pursued by the gas, as well as of the regulating hoods, may be found in Clegg on Coal Gas, 3d edition, p. 183.

With few exceptions, however, our condensers consist simply of a system of upright cylindrical pipes, standing upon sealing-boxes, and suitably joined in pairs at top by return bends, which somewhat primitive arrangement may be rendered a very efficient one by the application of refrigerating jets of water to the exposed surfaces of the upright pipes. It is true that in this way thorough action is had upon the exterior of the column of gas merely, yet marked benefit attends this application of water, owing to the cooling effect of evaporation, and the comparatively enormous capacity for heat which water possesses. (*a.*) The former consideration, in fact, renders this mode superior to immersion, and permits the gas to be cooled to a temperature lower than that of the atmosphere, a result unattainable by any mere "air" condenser.

And here may be given the following result of actual practice:

In a gas work sending out 90,000 cubic feet of gas *per diem*, it was found that in spite of 456 feet run of 10-inch condensers, (*b.*) and five large jets of water in action in the washers, traces of tar occurred in the purifying boxes, the gasholder drips, and even in the street drips. The item of "unaccounted-for gas" also, was heavy. The condensers were in the open air, next to the hydraulic main, while the washers were interposed between the condensers and the dry-lime purifiers. The engineer attributed the above objectionable results to their true source, imperfect condensation, and at once gave instructions for fitting over each return bend a jet from which water was allowed to trickle down the exterior of the vertical condensing pipes. The immediate effect was to completely prevent the deposit of tar in the purifiers and drips, while a sensible and simultaneous depreciation in illuminating value, due to the excessive washing of the thoroughly condensed gas, was obviated by the disuse of three washer jets; two being found ample to accomplish what, under previous conditions, had overtasked the original number. In addition to this, a diminution of two per cent. was noticed in "unaccounted-for-gas,' owing to the fact that there was less difference between the temperature at which the gas was registered respectively at the station, and the consumers' meters. The circumstance that no decrease in the yield of gas per ton was observed, was due to an accidental increase in the carbonizing power of the retorts, and in no way militates against the relation between volume and temperature, say one per cent. increase in volume for every five degrees increase in temperature.

In aiming at thorough condensation the fatal error of subjecting coal gas to a temperature below 45 deg. must at the same time be guarded against; it is true, hat the hydrocarbon vapors of Cannel-gas are of much lower specific gravities, and less easily precipitated by cold than those from Newcastle and other caking coals, but this fact should rather induce an increase of caution where the latter alone are used, than a relaxation of care where a varying percentage of the richer material is employed. (*c.*) To any one at all conversant with the practice of the larger companies, and with the difficulty which attends their efforts to supply gas of uniform quality, winter and summer, the sensitive nature of the hydrocarbons will be evident. We all know, that with equal percentage of Cannel, and uniform heats, gas, in winter (particularly in the northern States and Canada) compares unfavorably with the summer product, and on the other hand it is equally certain that the nearer gas can be kept to its normal temperature, both at the time of its entry into the dry-lime purifiers, and of its registration, the more advantageous and efficient are the subsequent and auxiliary processes to which it is subjected. How, then, is this desideratum to be attained? Surely not by adopting the erroneous principle of passing the nascent gas through a washer before its admission into the condensers, nor by expecting the washer, where properly interposed between the condensers and purifiers, to fulfil the half-performed functions of the condenser, as well as its own and only appropriate duty. The true *rationale* of these kindred stages of gas-making is to increase the efficiency of the condensers to the maximum point consistent with the preservation of the hydrocarbons, while the washer is employed merely to remove any excess of ammonia, its power to arrest any tar which may have escaped the condensers being a comparatively unimportant consideration.

A remark having been made, however, regarding the position of the washer which may be considered as heterodox, it may be well to define more particularly the considerations which serve to induce it. The only peculiar advantage of the washer is based upon the high affinity which subsists between water and the various ammoniacal gases. As an arrester of tarry vapors, or as a medium by which the gas is to be reduced to a temperature appropriate to the conditions of lime-purification, it is not to be compared to the simple and more efficient device of condensation.

And when water is directly applied prior to condensation, its almost instantaneous impregnation with tarry and ammoniacal vapors renders it powerless to retain the more subtle forms of ammonia, which at all times escape the condensers and lime purifiers) If a washer, in immediate juxtaposition to the hydraulic main, is to be rendered efficient for the removal of ammonia, such a quantity of water must be brought into immediate contact with the gas, as to tend very directly to the simultaneous absorption of the more permanent and valuable of the hydrocarbons; while, on the other hand, if the condensers receive the gas on its exit from the hydraulic main, and are provided with means for graduating their efficiency, no duty will be thrown upon the washer which it is incompetent to fulfil. When coal gas passes, at a temderature of say 50 deg., into the washer, there it encounters the mist which is reverberated from the "dash plates," and is so far stripped of its ammonia by the thorough application of a minimum quantity of water as a due regard to the stability of the hydrocarbons will warrant. The practice of passing gas through a *sheet* of water in the so-called "box" washer involves an error in principle, and sole reference is had in these remarks to the "jet washer" which, when working under a full head of water, assimilates somewhat closely in principle and effect to the "Gurney" jet. (Clegg on Coal Gas, 3d edition, p. 224.)

It should be observed, that the English engineers have been influenced in their condemnation of the washer by their experience of the "box" washer, since, beyond a theoretical admission of the (to them) novel advantage of Mr. Gurney's suggestion, they have, so far as published, never adopted this more judicious

(*a.*) It is stated that a quantity of heat which will raise a cubic foot of water 1 deg. will cause a similar accession of temperature to 2,850 cubic feet of air or gas.

(*b.*) Affording 1,200 feet of condensing superfices. The rule laid down in Clegg advises 150 square feet for every 1,000 cubic feet of gas registered per hour, *where the stratum of gas does not exceed three inches in thickness.*

(*c.*) Mr. Lewis Thompson, of London, after most ingenious and able research, gives the following as the specific gravities of the hydrocarbon vapors, atmospheric air being unity:

From Newcastle Caking.....	2.80 to 3.40
" Ince Hall Cannel.....	2.00
" Lesmahago..do.....	1.80
" Boghead....do.....	1.22

mode of the application of water. (*d.*) Accordingly, we see in England the faulty process of "scrubbing," or the yet more pernicious use of acids, readily accepted, as offering superior advantages to those possessed by the washer; and it is never forgotten that the presence of ammonia rather facilitates than embarrasses the action of lime in removing sulphur. While discussing the questions of the variations of temperatures one of our most eminent engineers recently stated his conviction that a thermometer is as necessary as a pressure guage at every stage of gas-making, and the time is not far distant when his suggestion will have been acted upon by men who now perhaps consider it an unnecessary refinement.

Thermometers for ascertaining gas-temperatures are provided with a simple attachment, by which the bulb is immersed in the gas whose temperature is to be ascertained. The graduated tube is, however, left exposed to the external atmosphere, which fact will, of course, influence a slight error in its record; but it may be questioned whether this error is of sufficient amount to counterbalance the advantages of simplicity which certainly attach to the instrument as at present made.

Whatever be the action of the condensers, a thermometer at their outlet furnishes little clue to the registering temperature. Chemical heat is generated in the purifiers, causing an accession of about 10 deg., but if the temperature at the inlet to the centre-seal be considerably above that of the atmosphere, and if the purifying boxes be of large relative surface, and exposed to a free current of air, a contrary effect will be observable. The pipe which connects the purifiers and the station-meter may, if it be of considerable length, and removed from any undue influence, deliver the gas at a low temperature; or its proximity to the retort benches may cause it to act as a heater. A multitude of local causes, some of them remediable, and others not, serve to influence the temperature of gas as registered, from which fact a statement of that temperature should uniformly accompany every report of leakage accounts.

(*d.*) Upon the question of the "box" washer, it should be stated that a series of photometrical experiments at the works of one of our largest interior companies, made many years ago, assigns a superiority of from 25 to 50 per cent. in illuminating value to the gas made from the "box" over that from the "jet" washer. This difference must have arisen from causes independent of the intrinsic merits of the respective forms of apparatus.

Diffusion.

Some very elegant and simple methods of exhibiting the phenomena of diffusion are given by Herr Merz in a recent number of the *Journal fur Praktische Chemie*. A portion of the shell of an egg having been removed by the action of hydrochloric acid, leaving the membrane exposed, the egg is to be suspended in water from the arm of a balance, a counterpoise being placed in the opposite scale. In about half an hour the weight of the egg has sensibly increased, as the position of the balance beam will show, in consequence of the passage of water through the membrane. If, now, alcohol be substituted for the water, and the weights readjusted, so as to bring the beam horizontal, it will soon commence to move in the opposite direction, showing that the egg has become lighter by the diffusion of water into the alcohol. The diffusion of vapor may be exhibited by tying a diaphragm of India rubber—a portion of a small toy balloon will answer the purpose—over the mouth of a funnel, the other end being in communication, by means of an elastic tube, with a vessel of water. The funnel being inverted over a dish containing ether, which, however, the diaphragm is not to touch, the vapor of this fluid will pass rapidly into the funnel, the air being observed to escape in bubbles in the water at the small end. Remove now the vessel of ether, and the operation will be reversed, the vapor passing through the diaphragm into the atmosphere. In order to fill the vacuum thus created, the water will rise in the tube, the lower part of which should be of glass, to render this apparent, and the diaphragm will be curved inwards. These experiments are particularly instructive, and are within the reach of every one. The balance may be extemporized by means of a light bar of wood.—*Scientific American.*

BEWARE OF BENZINE.—From the facility with which it removes grease spots from fabrics, this substance has come to be regarded almost as a household indispensable. But few persons, however, realize the explosive character of benzine, or the dangers attending the careless handling of the liquid. Being one of the most volatile and inflammable products resulted from the distillation of petroleum, it vaporizes with fireat rapidity, so that the contents of a four-ounce visl, if overturned, would render the air of a moderate sized room highly explosive. The greatest care should be exercised in handling this substance, in proximity to fire, and it is important to remember that the vapor escaping from an uncorked bottle will cause a flame to leap over a space of several foet.—*Scientific American.*

Report on Materials for Apparatus for Gas Works.

BY J. LAWRENCE SMITH.

United States Commissioner and Member of the Superior Council of the Exhibition at Paris in 1867.

(Concluded from page 277.)

GAS BURNERS.

As the end of all coal gas is to be burnt for the purpose of affording light or heat, it is only second in importance to the economical production of gas to obtain the greatest amount of light from a given quantity of gas; yet while there is continual attention given to this subject, but little advancement has been made during the last few years. This arises from the fact that the circumstances under which gas is burnt are so variable that no one rule is applicable in all cases. The unavoidable variation of pressure at the works, and in the main, are irregular, variable quantities; so are the differences arising in different stories of the same building, and other well known causes.

The only principle by which it is to be expected that a burner will regulate itself to the differences of pressure, is by the use of a diaphragm and conical valve like that used on the governor at the gas-works. Messrs. Suggs, of London, and others in different countries, and at different times, have adopted this principle, and Suggs' regulators may be seen attached to many of the street-lights in London. They are still far from being perfect, and this arises from the necessarily diminutive nature of the regulating adjustment.

There are some regulators which can very advantageously be attached to the gas-pipe as it enters the building prior to its distribution. The one on exhibition by M. Henri Giroud deserves special consideration, while at the same time it is far from filling all requirements; but, with the occasional superintendence of some one attending specially to the business, much gas might be saved to the consumer. The same inventor exhibits what he calls a *telegraphic regulator*, upon the same principle as the smaller regulator, but which can be attached to the main pipes in any part of their distribution; and, by a system of return pipes, electrical and clock movements, these irregularities are made sensible to the governor at the gas-works, which opens or closes the valve of the main regulator, and establishes the proper equilibrium between the pressure at the works and that in the main pipes. A thorough explanation of this apparatus would require several drawings and more detail than can be given in a report like this. It has been in practical use in several places, and is well spoken of.

But, after all, an attention to the cocks once or twice in the evening is the simplest and most economical way for private consumers regulating their consumption of gas. This, however, cannot be applied very conveniently in the public lights; so there is much yet to be done in furnishing a proper regulator to be applied to each lamp, either just under the burner or at the base of the lamp.*

The form of the jet through which the gas issues prior to being ignited is of the utmost importance to produce the best effect. Those now in general use are three: the *bat-wing*, a burner with slit; the *fish tail*, or Manchester burner, with two oblique openings in the end; and the *argand*, a circular burner with a number of small holes. The only investigations, the results of which are to be found in the Exposition, are those of M. M. Audouin and Berard, (the former connected with the Paris Gas-works), and have been conducted with the utmost skill and ability.

It is of importance to furnish in some little detail the results of these experiments, as they bear particularly on public lights; no reference will be made to the preliminary experiments, bearing upon the method of experimenting, or the photometric arrangement. The Carcel lamp, burning 42 grammes† of oil per hour, is the term of comparison; as the agreement between the city of Paris and the gas company is that from 25 to 27½ litres of gas, under a pressure of from two to three millimetres of water, must furnish a light equal to that of a Carcel lamp, burning in the same time 10 grammes of purified colza oil.

The first set of experiments was made with the *bat-wing* burner, with a round extremity connected with the main part of the burner by a short, broad neck. A variety of these burners were made, varying in the diameter of the button and the width of the slit, and the experiments with them gave the following results:

1st. That the maximum effect of illumination corresponds to a slit of 7-10ths of a millimetre.

2d. In comparing a tip having 1-10th of a millimetre with one having 7-10ths, with the same quantity of gas, the latter gave an illuminating effect more than four times as great as the former; consequently, the same quantity of gas can give, when it burns in a good tip, four times more light than when burnt in a bad one.

3d. That the intensity increases more rapidly than the increase in the width of the slit.

4th. That the augmentation of illuminating power corresponds to a very rapid diminution in the pressure, and consequently to a diminution of the flow of gas during the combustion; and that for each series of burners experimented with the maximum corresponds to a flow measured by a pressure of 2 to 3 millimetres.

The experiments in relation to the dimensions of the buttons at the end of the burners showed that as the dimensions of the buttons became greater the flame became less steady and had a tendency to smoke.

That for every given consumption of gas there was a button of a given diameter, that produced the best effect, using a slit of 7-10ths of a millimetre, which, as has already been observed, gives the most advantageous results; the diameter of the button employed in Paris for the slit above mentioned, which is the one now used, is seven millimetres.

Although the results of the experiments have led to the use of the *bat-wing* burner in public lights, it is as well to state the results of M. M. Audouin and Berard in relation to other burners. As to the *fish-tail* or Manchester burner, it was shown that it should be burnt with a pressure of at least three millimetres; if this were not the case, the two jets of gas do not encounter each other with sufficient force to spread the flame. The diameter of the holes for the maximum of illuminating effect is comprised between 7-10ths to 2 millimetres, but it is necessary for holes of this size to consume about 200 litres of gas. For the consumption of 100 to 150 litres of gas per hour the diameter of the holes should be about 1¼ millimetres. The *argand* burner, which consists of a circular ring pierced with small holes, is much in use for private illumination, especially in Paris, and the study of this burner was a matter of considerable interest, and the result of the experiments that the differences in intensity were due: 1st, to the diameter of the holes; 2d, to the number of holes; 3d, to the distribution of the air; 4th, to the height of the glass chimney. As regards the size of the holes, a diameter of 7-10ths of a millimetre is considered the most advantageous; as to the number of the holes, a large number was considered advantageous; 30 being a convenient number, a feeble pressure giving the best effect for the same amount of gas. A cone to concentrate the air on the flame is useful, and the best height for the glass chimney was 20 centimetres. The advantages in illuminating effect increase indefinitely with the amount of gas consumed, and can be carried even to the point at which the flame passes the glass, when of course further increase becomes impracticable. All of these statements in reference to this burner have reference to its equaling the illuminating effect of a Carcel lamp, burning 42 grammes of oil an hour.

The same experimenters have shown that when it is required to illuminate a large space, it is best to increase the size of the burner, as by that means the maximum effect is obtained from a given quantity of gas; and the city of Paris has adopted one giving the effect of 3½ carcel lamps with the consumption of only 360 litres of gas. It is a *bat-wing* burner with the diameter of the button of 15 millimetres and a slit of 6-10ths of a millimetre.

MATERIAL FOR TIPS OF BURNERS.

These are made either of metal or earthen material. Of the metals, iron, bruss, and various compositions are used. The earth materials are lava, porcelain, soapstone, and artificial compounds resembling these. There is nothing new under this head, except that great progress has been made in the manufacture of burners of every form and description from these earthen materials, and they are likely to replace to a considerable extent those of metal, as the small openings are not as liable to be stopped up by the action of the air as the metallic ones are.

COLLATERAL USES OF GAS.

In various departments of the Exhibition are to be seen a variety of uses to which gas is applied, besides that of illumination. Lenoir, Hugon, Otto and Langen have developed its use as a motive power by igniting a mixture of air and gas in cylinders. For domestic uses, as that of cooking, it has received a very extensive application, and can be employed economically under a variety of circumstances. Stoves, large and small, of various devices are to be found, especially in the English and French departments. It is also used largely by the workers in metals for the purpose of soldering, and various other manufactures where a conveniently regulated and an intermittent source of heat is required. The chemist in the laboratory for analysis and research uses gas to the exclusion of almost all other sources of heat, and a great variety of convenient and ingenious arrangements for their uses are to be

* In this connection we would mention "Thompson's Automatic Gas Controller," which is a small attachment at the burner which controls and regulates the pressure better than anything we have seen. These Controllers are cheap and effective, and can be had at the office of the AMERICAN GAS-LIGHT JOURNAL.

† Thirty grammes are about one ounce, one litre is about one quart, 24 millimetres are about one inch.

found in the German, French and English departments. There is, however, no really novel form of apparatus on exhibition. Some remarks on its application as a motive power will be doubtless made in the proper section of this report.

PORTABLE GAS WORKS.

There are several on exhibition, but they represent nothing of noteworthy novelty. M. M. L. Coignard & Co. exhibit small gas works, on the plan of M. G. Jonanne, for the purpose of using all substances capable of furnishing illuminating gas. In the English department there are several compact and economical gas works from two or three makers. Mr. George Bower makes gas works furnishing six to eight lights for four hours at the price of $110.

NEW FORMS OF ILLUMINATING GAS.

For many years various efforts have been made to impregnate air with the vapor of the light hydrocarbons, and igniting the vapor thus suspended as it passes through burners similar to those used for ordinary gas. Under some circumstances very good effects are produced. But variations of temperature interfere with the regularity of the light, and in places where public gas works exist they cannot be brought into use, even if it should be shown that the consumption of material to produce a given illuminating effect is less expensive than the cost of the public gas, for certain manipulations are necessary which are incompatible with the nature of service to be found in private houses.

THE CHEMISTRY OF GAS-MAKING.

A report on this subject will be furnished from section 44, class 5, and the progress made in the subject deserves special consideration, not only in regard to the manufacture and purification of the gas, but to the utilizing of the waste products. Under this head I will merely make a statement in regard to the operations of the Paris gas-works—and in doing so, there is no injustice done to other gas-works, for none of them work up so thoroughly the waste products.

In 1856 all the gas-works in Paris were amalgamated into one, conducted by a private company, which supplies Paris and all its suburbs for six or seven miles outside of the fortifications of the city, which last have a circumference of about twenty miles. In 1856 the annual consumption of gas was 1,671,746,970 cubic feet. In 1866 it had increased to 4,320,491,244 cubic feet, and the capacity of the works is sufficiently great to supply five billions of cubic feet of gas per annum. There are 71,836 private consumers and 32,232 public lights. To produce the amount of gas required, the works used in 1866 421,000 tons of coal.

"The coke produced in 1866 by the Paris Gas Company amounted to 613,626 chaldrons, part of which was consumed in the gas works and the remainder sold to the public. To facilitate the sale of the coke the company manufactures stoves specially adapted to heating by this means, and sell them to the public at a very moderate price. The heating by coke offers so many advantages that from the 1st of January, 1858, to the 28th of February, 1867, the Paris company sold to private individuals alone 16,909 of these stoves. The quantity of tar produced from the distillation of coal amounted last year to 21,540 tons. To facilitate the disposal of this product the company are obliged to distil a large portion of it. Of the 21,540 tons produced in 1856 they distilled 20,074 tons, which yielded 13,600 tons of pitch, at the price of from $1.50 to $2 per 220 pounds, the substance being used in the manufacture of patent fuel and artificial asphaltes. They obtained, besides, 524 tons of light oils and 3,660 tons of heavy oils. The former have been sold as benzine for scouring clothes, for painting, and in caoutchouc manufactures, or they have been converted into nitro-benzine or aniline. The production of nitro-benzine amounted to 133 tons, and that of aneline to 1,327 pounds. With regard to the heavy oil (creosote), it has been sold to the dealers in wood, and has been almost entirely employed in the impregnation of railroad sleepers. A certain quantity of this heavy oil has been purified and used as a lubricator and in common painting. The tar oils always yield an appreciable quantity of phenic acid, which, in a liquid state, is of use for disinfection, and when crystallized for the making of picric acid, and is used in medicine. The purification of gas supplied last year about 3,000 tons of ammoniacal products, either in the form of sulphate of ammonia or volatile alkali. A certain quantity of sulpho-cyanide of ammonia has also been obtained from the products of the condensation of gas. The waste materials used in the purification of gas have been purchased by the manufacturers of Prussian blue; but as the residuals contain not only sulpho-cyanides and cyanogens, but also a considerable quantity of sulphur in a free state, the company have treated a part of them by a special process, and have obtained a material which contains from 55 to 60 per cent. of free sulphur, which may be employed in manufactures or in agriculture. It will be seen from these results that the company have turned to good account the residual products of the distillation of coal."

The gas of these works is most thoroughly purified, and the dealers in silks and other delicate fabrics, who a few years ago always suffered more or less loss from the effect, the results of the combustion of the impure gas acting on their fabrics, now no longer suffer from that cause. The purification of their gas, as that of a great many of the large establishments in Europe, is affected by the oxyde of iron, which, although a little more costly than lime, has the advantage of being readily restored for repeated uses, and avoids the accumulation of that most disagreeable of residues—gas-lime. My observation, however, leads me to believe that the purification by oxide of iron had better be aided by the wet lime process. Much more might be said on the present condition and requirements of gas making, but to do so would exceed the expected limits of this report.

The Oxy-Hydrogen Light.

This was first introduced to public notice by Lieut. Drummond. It consists of a jet of oxygen and hydrogen gases, or of alcohol and oxygen, burning so as to ignite a piece of lime or magnesia; and the high temperature which is thus produced, renders the earthy body so incandescent as to be intensely luminous. The apparatus which is employed for the production of this light has, at various times, undergone considerable alteration and improvement. Originally, the mixed gases, consisting of two parts by measure of hydrogen and one of oxygen, were condensed by means of a syringe, worked at great pressure, into a square metal box, from which there issued a long jet of very small bore; this jet passed through a thick oak partition, in order that the operators might be protected from the danger which was incidental to the bursting of the metal box from explosion. This was the form of apparatus originally contrived by Clarke and Newman. After this the safety jets of Gurney, Hemming and others, were adopted; and at the present time it is customary to burn the mixed gases by means of the latter, or else to deliver the gases separately into a double jet or nozzle, where they mix immediately before they are consumed. Both of these plans are very manageable, though the latter is thought to be less open to the risk of explosion than the former.

The hydrogen gas is obtained by acting on zinc with diluted sulphuric acid (one of acid to ten or twelve of water), and the oxygen, by heating a pulverulent mixture of four parts of chlorate of potash, and one of peroxide of manganese in a glass retort. In each case the gas is to be collected in a gas holder, or else in bladders fixed to receivers over a pneumatic trough. Mr. Watson has obtained a patent for procuring the gases already mixed in proper proportions by the decomposition of water by galvanic agency; but the process is an expensive one.

When the mixed gases are burnt, the flame is protected upon a small cylinder of lime or magnesia, which is from time to time turned round, so as to expose a fresh surface to the action of the flame.

Another mode of obtaining this light, is to throw a jet of oxygen into a flame of spirit of wine or ether, or to mix the oxgen with coal-gas instead of with hydrogen.

The light which is obtained by either of these plans is very intense. When concentrated by means of a concave mirror, it is distinctly visible at a distance of sixty-five miles; and it is calculated, that when it is compared with the light of a wax candle, the mixture of oxygen and coal gas is equal to twenty-nine of such candles, that of alcohol and oxygen to sixty-nine, that of ether and oxygen to seventy-six, and that of hydrogen and oxygen to one hundred and fifty three. In consequence of the great intensity of the oxy-hydrogen light, it is generally used for the phantasmagoria, the dissolving views, the solar microscope, and for theatrical illuminations and experiments in optics; besides which, it has been recommended for light-houses and signal lights. The light differs from all others in the circumstance of its being exceedingly white, and therefore well suited for the display of bright and delicate colors. With this light the various shades and tints of a picture or dress are as plainly discernible as they are by the diffused light of day.—*Gas Eng. Book of Reference.*

CAUSE OF THE INTENSITY OF THE ELECTRIC LIGHT.—The production of light by chemical action depends upon two conditions: First, there must be solid particles in a fit condition to take up the motion; and secondly, chemical action to impart the motion to them. The light produced by combined hydrogen and oxygen, is of itself feeble; but when it plays upon a piece of lime, that lime is sublimed by the heat, and the particles moving in the flame give an intense light; much more so, for instance, than the more slowly moving particles of carbon in the flame of an oil lamp. It is to the more *rapid motion* of the particles in the electric light, that its greater intensity is due. The current passes through carbon pencils, particles from which are set in motion with inconceivable rapidity.—*Scientific Press.*

Correspondence.

ST. LOUIS, MO., March 18, 1868.

EDITORS AMERICAN GAS-LIGHT JOURNAL:

Gentlemen: I am pleased to hear of Mr. Smedberg's intention of getting up a "Synopsis of Gas Lighting," and shall use my humble influence in his behalf. I shall take one for myself, one for Quincy, one for Kansas City, one for our company in St. Louis, and A. Gridly, Esq., owner of the gas works in Bloomington, Ill., will take one. I think there ought to be no failure in making up a greater number of subscribers than what is proposed to insure its publication.

I have, for some time, thought I would send you a few items about the works I built last year in Kansas City, Mo. They are mostly owned by Oliver A. Hart, Esq., and myself, each having an equal interest. The capital stock is $168,000, and the size of works are as follows: the lot is about one and a half acre; gasholder 50 by 20 feet; retort house 55 by 52 feet, capable of holding ten benches—five benches built and the machinery complete; purifier and condenser; scrubber house 37 by 27 feet, with purifiers 6 by 12 feet; lime house 27 by 16 feet; meter house, governor and office 26 by 18 feet; meter 4 feet 10 inches in all; leading pipes about works are 8 inches; about two miles of street mains laid, 8, 6, 4 and 3 inch, with fifty-six lamp posts in use, and expect thirty-five more this summer. There are about 112 private consumers, and every likelihood of its increase to 200.

I must close this communication by requesting you to agitate the convention of gas engineers and superintendents, at an early day. I am convinced that much good might be accomplished by such a meeting if got up in a right spirit.

I remain, gentlemen, truly yours,

THOMAS PRATT,
Sup't Gas Works, St. Louis, Mo.

Smedberg's "Synopsis of Gaslighting."

BURLINGTON, IOWA, March 25, 1868.

James R. Smedberg, Esq.

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Yours respectfully, R. SPENCER, Sec.

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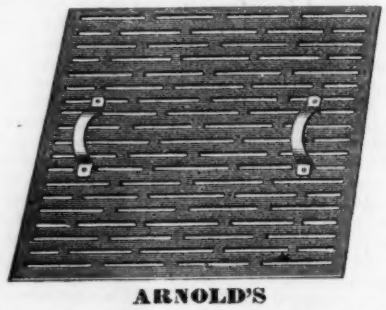

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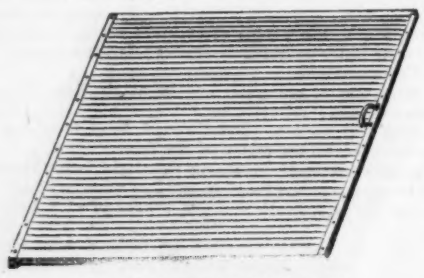

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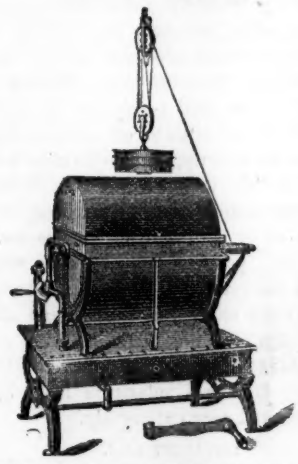

We manufacture eight sizes of the SOLAR GAS MACHINE, ranging from ten to five-hundred light capacity. Every machine is put in operation and fully tested before it is sent off, and is guaranteed to give perfect satisfaction. This new apparatus is the result of 15 years of experience in this special line of manufac ure, and we feel warranted in asserting that our machine excels all others of a similar kind in the market. It is much simpler and more efficient than any former manufacture, and is constructed with special reference to safety and durability. There is no possibility of an explosion under any circumstances whatever, nor is the gas tank likely to leak or give out, or any part of the machine to get out of order, if reasonable care is taken of it. From five to fifteen minutes' attention is all that is required to keep any size of machine in perfect working order to supply all the burner-jets in a dwelling or factory.

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Yours respectfully,
WM. C. BARNES.

BOSTON, Aug. 22, 1867.

MESSRS. O. P. DRAKE & Co., 8 Bedford-st., Boston:

Gentlemen: I purchased of you, Nov. 18, 1865, one of your Solar Gas Machines, for my house at Auburndale; and from that time until the present, I have enjoyed uninterrupted success with it. The light is uniform, clear and steady, and the best I have ever seen. I have never experienced trouble of any nature from the machine, and consider it invaluable. As to its safety as compared with any other illuminator, I consider it far superior, and have discarded everything else in the shape of oil, fluid, kerosene, etc. Hoping your invention may prove remunerative, I remain,

Yours respectfully
W. E. PLUMMER,
58 Merchants' Exchange.

LAKE FOREST, ILL., Aug. 30, 1867.

CHAS. MATTHEWS, ESQ., Agt of Drake's Solar Gas Mach., Chicago:

Dear Sir: Your letter was received, asking how I liked the working of the Solar Gas Machine put up by you for me. I would say that I have had the machine in constant use for the last 6 months, and am well pleased with it. The light is clear and steady, and the whole apparatus works to my entire satisfaction.

Yours,
WM. S. JOHNSTON, Jr.

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We keep on hand range in size from No. 1 to No. 4, and occupy a space for No. 1, 2 x 3 feet, 2½ feet high up to 2¼ x 5 feet, 4½ feet high for No. 4; weight of machines from 350 to 1,000 lbs. The No. 1 will supply 5 Argand or 10 bat's-wing burners 6 hours, and No. 4 will supply 50 Argand or 100 bat's-wing burners 6 hours.

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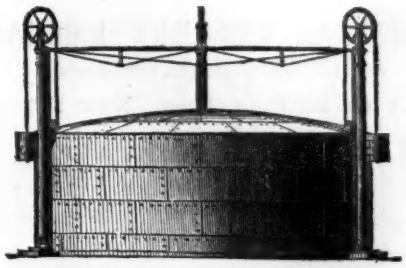

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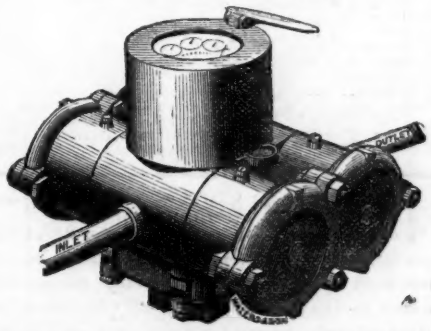

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AND

AMERICAN GAS-LIGHT JOURNAL,

Published on the 2d and 16th of Each Month

At No. 22 Pine Street, New York.

M. L. CALLENDER & CO.,

EDITORS AND PROPRIETORS.

THURSDAY, APRIL 2, 1868.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

SUBSCRIBERS would confer a favor upon us by remitting CHECKS or POST OFFICE MONEY ORDERS, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

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Answers To Correspondents.

R. S., of New Orleans.—Iron is the best material for gas fittings, both for strength and durability; iron is less acted upon by gas than any other commercial metal: its decay seems only to result from the action of air and moisture, and takes place more on the outside than the inside.

M. L. P., of Cal.—Gas of itself is not explosive; it is only so when mixed with air; one volume of gas to eight volumes of air is the most explosive mixture, one of gas to four of air is not safe, and all mixtures between four and fourteen parts are more or less dangerous. It is, however, possible, and even probable, that explosions have taken place where only one per cent. of gas was present.

O. M., of St. Louis.—The singing or hissing noise made by gas in passing through burners is objectionable, especially in private apartments, and may be prevented by fixing a stop-cock in some part of the fittings leading to the burners, but at some distance from them. By regulating the supply by this cock (those at the burners being turned full on) the noise will cease.

L. B., of Cin., O.—To find the weight of a given volume of gas in pounds avoirdupoise, multiply the volume by the specific gravity in order to find the cubic feet of air equal in weight to the volume of gas. Then, as a cubic foot of air weighs 536 grains, of which there are 7000 in the pound avoirdupois, multiply by 536 and divide by 7000, or, what is the same, multiply by .0766.

R. S., of Phila., Pa.—Carbonic acid may be detected adding to water impregnated with gas a few drops of sulphuric acid, when minute air bubbles of carbonic acid will be rapidly disengaged. Another test is to pass the gas through a solution of pure baryta in the blue tincture of litmus, when, if carbonic acid be present, carbonate of baryta will be precipitated.

SMALL DEFECTS IN IRON CASTINGS may be filled with a composition made by fusing together nine parts of lead with two of antimony and one of bismuth. This metal expands in cooling, and will keep its place.

DANGEROUS ILLUMINATORS—GAS vs. OIL

Few of the millions who use kerosene or coal oil for illuminating purposes are aware of the great difference there is in the quality and value of the article, as sold in market to consumers. And it is this ignorance that is the cause of the numerous and constantly increasing accidents caused by the explosion of the *domestic torpedoes* or hand-grenades called lamps, which so many unsuspicious victims allow to be introduced into their houses, where, at some unforeseen moment, their infernal power scatters destruction, and perchance death, wildly around. We do not wish to be understood as condemning the use of lamps, but we do most solemnly protest against the indiscriminate use in lamps of the inferior and adulterated oils which cupidity and ignorance—one or both—are answerable for. Gas for illuminating purposes may be safer and more convenient; but generally, only cities and populous communities can enjoy this luxury, and although the introduction of the different improved portable gas apparatus extends and is extending this blessing considerably, yet some substitute like oils, etc., must be employed very extensively.

DIFFERENT OILS.

Kerosene is the popular name for refined petroleum, and was originally used to designate oils distilled from coal. At present it is obtained by the distillation of crude petroleum as it comes from the wells in its natural state, which is composed of a variety of liquid hydrocarbons, volatile at different degrees of temperature. In the process of distillation for use, these different substances are separated, the most volatile, of course, passing over first. In this way we may first obtain a material called Chymozéne, so volatile as to boil at Zero. Gasoline passes over later, which is also very volatile, and of course very inflammable and dangerous in lamps. These first distillations are largely used at present for carburetting gas to increase its luminosity; or air alone is charged with its vapor by special apparatus which converts it into an illuminating gas commonly known as "Portable Gas," "Air Gas," or "Pneumatic Gas," etc. And only in such apparatus should it be employed, where its safe usage is provided for. Next comes Naphtha, also very inflammable, and quite unfit for use in lamps, although much is sold under various pretentious names, such as "Ligorine," "Security," "Commercial," "Light-Oils," etc. is used in lamps, mostly packed with cotton or some porous substance to absorb the fluid and prevent, in a measure, its being spilled or scattered when an accident occurs to the lamp. Refiners often throw away this material in large quantities, or sell it, for a trifle, to jobbers and retailers, who use it extensively to adulterate good oil. Indeed, it has been estimated four-fifths of the kerosene in common use has been depreciated by adulteration.

The next distillate is true Kerosene or Petroleum, which, when pure, will not ignite at a less temperature than 110° Fahrenheit. This is perfectly adapted to burn in lamps with safety. After this comes a heavy oil and residuum, mostly used for lubricating machinery, or for the manufacture of portable gas by destructive distillation in apparatus especially adapted for this purpose.

CAUSE OF EXPLOSIONS.

The light oils denominated explosive are not explosive of themselves. In all cases of explosion the volatile vapor of the oil combines with the air in the lamp or other vessel, when nearly empty of its oil, to form an explosive gas somewhat similar to the "fire-damp" in mines. In the act of filling the lamp when in this condition, and especially if the lamp is warm, the approach of a light ignites the gas within it, or perchance the filling can, and an explosion takes place which scatters the combustible material in every direction, to the imminent risk of life and property. In putting out a light, the wick should always be turned down until the light is quite extinguished. Blowing down the chimney of a lamp to extinguish the light when burning the adulterated oils of commerce, is about as dangerous as to blow upon the ignited fuse of a *bombshell*; and is reprehensible to the last degree, because it drives the flame through the vent into the oil receptacle which is sure to explode if the proper proportion of vapor and air happen to be present. True, this proportion may not be present in a hundred cases, and it may be in the *first* instance. Then why take the risk?

PATENT NON-EXPLOSIVE OILS—SO-CALLED.

The country is overrun with mendacious speculators, who pretend to have a secret or patent process to render the light and cheap distillates of petroleum non-explosive. Beware of such men as you would of a Guy Fawkes. The wondrous experiments they will make before you to test the safety of their oil is a delusion and a snare. They will put a lighted taper or a red-hot poker into the lamp, or pour it a-flame from one receptacle to another, with perfect safety and composure;—but they are always careful to observe the laws which govern these contingencies.

If the lamp is *full*, or the other vessels, there is no room for gas to form as a matter of course, and the fluid will only hiss and fume and blaze, and the hand, placed over the top, will extinguish it. But empty the lamp of nearly all its *non-explosive oil*, and warm it a little and swing it about to introduce sufficient air, and then try it with a lighted match, and the chances are some one will be enlightened—and some one else will be ready to leave in search of other and less enlightened victims. Not far from where we are writing, a few days ago one of these itinerant incendiaries, more ignorant than usual, entered a dwelling to sell his "non-explosive" oil, and, to test it, introduced a lighted match into a *partially empty* lamp. The result was an explosion which horribly burned a woman and set fire to the premises. The man fled. The woman has since died.

Congress has enacted a stringent law punishing, as a misdemeanor, the sale of adulterated illuminating oils. The penalty for violation is a fine of from $100 to $500, and imprisonment from six months to three years; but the law is only a dead letter so long as the people whom it is intended to benefit, are either ignorant of its enactment or allow themselves to be imposed upon by unprincipled dealers who furnish them an inferior article, that they make an extra profit of $10 or $15 a barrel. Those who use illuminating oils should purchase only the purest article, and from dealers who make it a specialty to supply a standard article.

FIRE-TEST FOR OILS.

The question will arise how to distinguish good oil from the inferior and adulterated article. The most simple and convenient way is, to half-fill a saucer with water, say 110° or 115° Fahrenheit; pour upon the water one or two spoonsful of the oil to be tested, hold a lighted match or paper a few inches above, and gradually lower it to the oil. If the vapor or gas arising from the oil flashes, and the oil finally ignites and burns, it should be rejected as bad. If such oil is used in lamps, or ignorant servants use it to start the fire in a hurry, it is very probable a terrible "Kerosene Accident" will be chronicled in the next day's bulletin. If, on the contrary, the match can be introduced into the oil, and burn out without igniting the oil, it may be

considered "non-explosive," and is safe for all domestic purposes.

GAS VS. LAMPS.

The comparison of gas with lamps, candles, etc., for illuminating purposes in point of safety seems unequivocally to be in favor of gas, and Insurance Co.'s who do not, must soon discriminate in their insurance rates, unless some method is devised to prevent the introduction of adulterated and explosive oils; otherwise, their dividends will be likely to fall on the wrong side of the ledger.

In looking over the reports of a prominent Fire Insurance Company for nine years, we find the proportion of losses by fires caused by gas, compared with candles and lamps, to be only about 45 per cent., and by adding the fires caused directly by camphene and coal oil, the percentage is reduced to about 33 per cent.

In a careful examination of the reports of 24,000 fires in the United States and England, the number of fires caused by gas-lights, including leakage and explosions, etc., was 1,090, while the number of fires caused by candle and lamps, including fluid, camphene and coal oil, was 1,856, a large percentage in favor of gas. The loss of life and property by the accidents arising from adulterated illuminating oils has increased enormously within the past two or three years; and the lamp and oil trade will unavoidably suffer in consequence, and inure to the benefit of gas stocks, until the public are protected from imposition and fraud by the stringent enforcement of existing or new laws which will meet the case.

INCIDENTAL ITEMS.

One chair in our editorial sanctum is vacant, owing to the departure of its former occupant, Mr. JAMES R. SMEDBERG, for San Francisco, where he goes to take charge of the extensive gas works of that Emporium of the Pacific. Although Mr. SMEDBERG, to our great personal regret, leaves us, to put in practice that which he writes about, we can congratulate our readers and ourselves in the assurance that his pen will still be an active contributor to the columns of this Journal. The excellent qualities of head and heart possessed by Mr. SMEDBERG makes him one of Nature's noblemen—a true gentlemen. We miss and shall long miss him, and shall envy those who will enjoy his society and be benefitted by his genius. "May his lines fall in pleasant places."

In our correspondence will be found an interesting letter from Thomas Pratt, the able and well known engineer of the St. Louis gas-works. The extremely liberal manner Mr. Pratt subscribed for the "Synopsis of British Gas-Lighting" is a very flattering and substantive indorsement of his appreciation of its value. Let us say, in the language of Scripture, "Go thou and do likewise." In this connection we desire to ask those who have subscribed to observe if their names appear in our published list, and if not to advise us. The check book containing the list of subscribers has been mislaid or lost; hence, some of the later subscribers may have been left out.

The attention of gas and water companies is directed to the advertisement, on page 298, of Messrs. T. G. Gaylord & Co., Great Western Pipe Foundry, Cincinnati, O. This firm manufactures "Robbins' Patent Joint," the most perfect connection for street mains. Its superiority consists in the facility for laying, economy in lead, and its perfection as a joint. Experiment has fully demonstrated that this joint is entirely reliable, infinitely superior, and more economical than any other. The manufacturers offer to contract with water and gas companies to lay the pipe in the trench, even under water, and guarantee the joint to be absolutely tight. These joints are also manufactured at West Jersey Foundry, Camden, N. J., John W. Middleton, Agent, Philadelphia, Pa.

We have a report before us of B. P. Brunner, gas engineer, on the Virginia City gas-works, Virginia City, Nevada. These works are for sale, and it appears to us some of our Eastern or San Francisco capitalists will find it a good chance for investment. Considering the first cost of the works ($75,000) they seem to be paying a very liberal interest, which, we are assured, is about 1¼ per cent. per month in gold. We shall endeavor to refer to this property more in *extenso* in our next number.

The advertisement of Messrs. BLISS & Co. in this issue, brings to mind that we lately saw in their extensive establishment some of the most chaste and elegant designs in bronze ornamentations of gas chandeliers, and in the various styles and forms of gas fixtures. These designs are original with this house, and will compare favorably with anything at home or abroad. One style of chandelier especially arrested our attention. It was a very unique and elaborate imitation of the ancient Egyptian bronzes, copied from the relics of the Pyramids. The late novel and useful improvement in drop-lights for chandeliers, by Mr. A. Bliss, is worthy the attention of all who are in the trade.

We are pleased to hear that our suggestion to gas companies how to increase their dividends by a small investment in reliable books on gas-lighting for their engineers has taken effect, as we are assured, by receiving several orders to forward sets of said list. The satisfaction of this is three-fold: to the recipient of the books—to the shareholders of the gas companies—and to ourselves, who have been the humble instrument to make the happy suggestion that will lead to so much good.

The plan of holding a Convention of Gas Engineers seems to meet with general favor, and we are receiving numerous letters approving it: but we desire to have every company or person interested in the matter signify by letter their *approval and intention* to attend the call, or the contrary, so we may publish a full list as early as possible.

Prof. H. Dussauce, Editor-in-Chief of the *Journal of Applied Chemistry*, has recently resigned his post, as its conductor, and has now no connection with it.

FIRST PRIZE.

THE

EMPIRE SEWING MACHINE CO.

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FIRST PREMIUM

AT THE

GRAND FAIR OF THE AMERICAN INSTITUTE,

In New York, October 26th, 1867, for the

BEST FAMILY AND MANUFACTURING MACHINES.

The points are Superiority in Construction, Simplicity, Stillness in Running, and wide range of work done by their Machines.

It requires fifty per cent less power to drive it than any other machine in the market. A girl 12 years of age can work it steadily and without injury to health.

For further particulars, circulars and Agents' terms, apply to the Company.

Agents wanted where none are established.

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And Every Description of

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With a Complete Assortment of

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A PRACTICAL TREATISE OF THE

Manufacture and Distribution of

COAL GAS,

Its Introduction and Progressive Improvement, Illustrated by

Engravings from Working Drawings,

With General Estimates by

SAMUEL CLEGG, Jr.

LONDON: Trubner & Co., 60 Paternoster Row.
D. VAN NOSTRAND, 192 Broadway, New York. 199

A SYNOPSIS OF

BRITISH GAS LIGHTING

[To be Published August 1.]

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This work will comprise the essence of the London *Journal of Gas Lighting*, from February 10, 1849, to December 31, 1867, and afford a succinct resume of the entire English Gas Engineering between these dates.

The excerpts will, as far as possible, be symmetrically arranged under the heads of Coals, Distillation, Purification, Volumetry and Photometry.

It is to be executed by JAMES R. SMEDBERG, Engineer San Francisco Gas-Light Company. Subscriptions should be addressed to the offices of the AMERICAN GAS-LIGHT JOURNAL, 22 Pine-st. New York.

It will be issued only to subscribers.

It will be of great value, not only to Gas Companies and Engineers, but to those who represent the enormous collateral interests of Gas-Lighting—to Chemists, Gas Fitters and Patentees, as well as to scientific men generally.

The work will not be published until 200 subscriptions are received. Subscription price, $15.

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Manufacture and Distribution of

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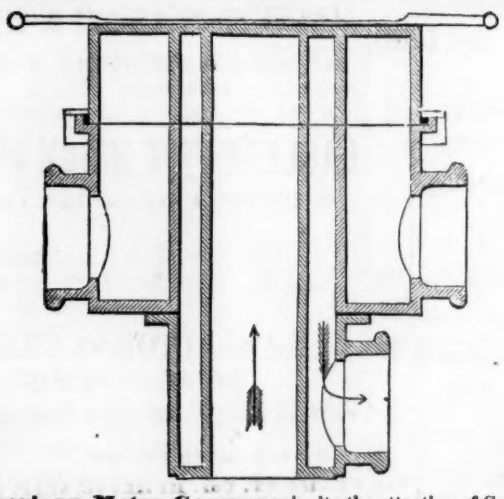

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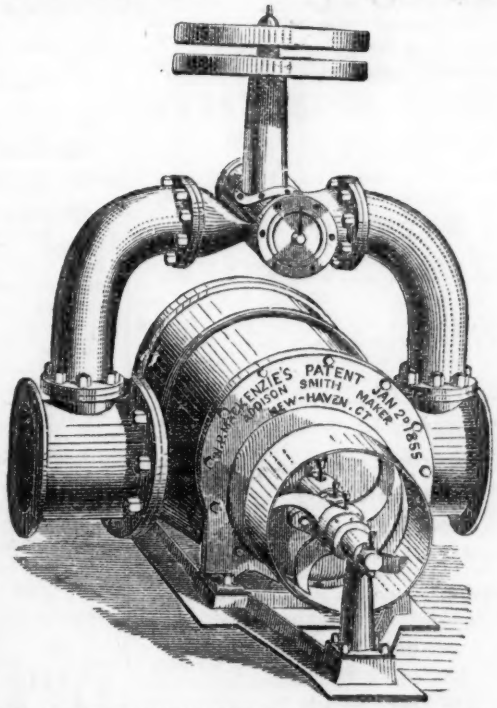

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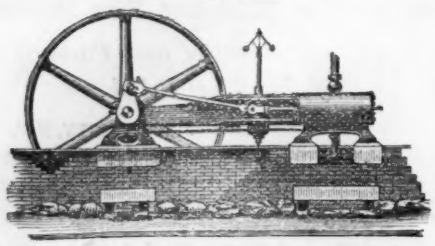

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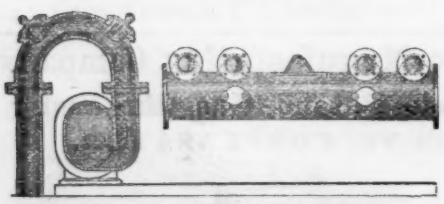

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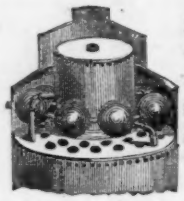

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Will not crack or break from sudden changes of temperature, is readily cleaned, and with ordinary care should last just as long as he lamp on which it is used. Liberal discount allowed to the trade. Samples sent on receipt of fifty cents.

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PLASTIC SLATE

FOR

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The process of reconstructing Slate Stone from a disintegrated state was

PATENTED FEBRUARY 21st, 1865.

It is a combination of

Pulverized late & Viscous Matter,

(the latter possessing qualities of geological and chemical affinity for the former,) and is a development of one of the simple but unalterable tendencies of nature.

As a Roofing Material it Stands Unrivalled.

A mastic—it adapts itself to every shape and slope. Non-combustible, impervious, non-expansive, and undecaying.

Frost does not Crack nor Heat Dissolve it.

The only roofing material ever discovered that will resist the action of the elements as long as the structure it protects. Being susceptible of little, if any wear, from exposure, and

Perfectly Fire-Proof,

It is unequalled as a coating for Railroad and Farm Buildings Fences, Bridges, bottoms of Vessels, Vaults, etc.

GAYLORD'S PATENT COUPLINGS,

Fig 3

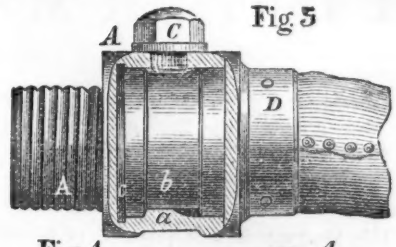


Fig 4

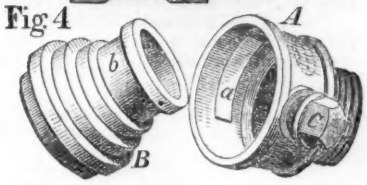
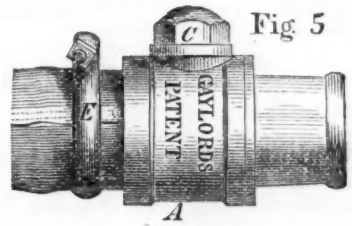


Fig. 5



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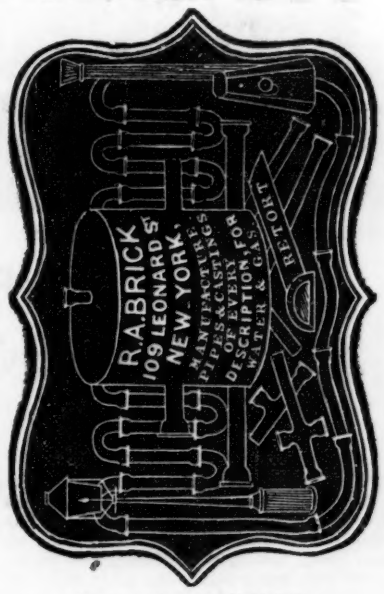

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This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS AND REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy and excellence of workmanship. Orders addressed

AMERICAN METER COMPANY,

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HARRIS & BROTHER,

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Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia,

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Guages, Indicators, Photometers, and all kind of Gas Apparatus; also furnish all other Articles appertaining to the use of Gas Works.

From our long Practical Experience of the Business (covering a period of 20 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.

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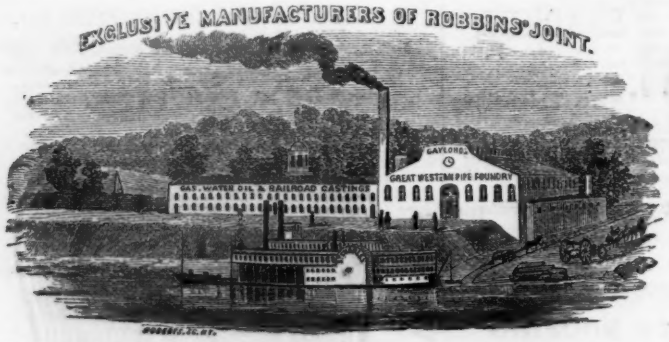

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THE ATTENTION of the public and the trade is invited to our New Scale, Seven Octave, Rosewood Piano Fortes, which for volume and purity of tone are unrivalled by any that have hitherto offered in this market. They contain all the modern improvements, French Grand Action, Harp Pedal, Iron Frame, Over-strung Bass, etc., and each instrument, being made under the supervision of Mr. J. H. Grovesteen, who has had a practical experience of over thirty years in their manufacture, is fully warranted in every particular.

THE "GROVESTEEN PIANO-FORTE"
RECEIVED THE HIGHEST PREMIUM AT THE
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Where were exhibited instruments from the best makers of London, Paris, Germany, Philadelphia, Baltimore, Boston, and New York; and also at the American Institute for five successive years, the gold and silver medals from both of which can be seen at our warerooms.

By the introduction o improvement we make a still more perfect Piano-Forte, and by manufacturing largely, with a strictly cash system, are enabled to offer these instruments at a price which will preclude all competition.

PRICES

No. 1,	Seven Octave,	round corners,	Rosewood, Plain Case,	$300
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TERMS—Net Cash, in current funds Descriptive circular sent free on applicat n.

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VALVE WATER METER,

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Is now in use by many City Water Cos., because of its low price, simplicity, durability, accuracy under any pressure, and (a great advantage) because it runs with less head than any meter used. Manufactured by H. Q. HAWLEY, Albany, N. Y.

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Manufacture Wrought Iron Welded Tubes for Gas, Steam or Water; Lap-Welded Boiler Flues, GALVANIZED WROUGHT IRON TUBES,

ARTESIAN WELL PIPES,

of Wrought or Cast-Iron, screwed together, flush inside and out; Gas-works Castings, Retorts and Bench Castings for Coal Gas-works,; Cast-Iron Street Mains, Bends, Branches, Drips, &c.

Gas and Steam Fitters' Tools, &c.

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Retorts, Bench Castings, Condensers, Washers, Scrubbers, Wet or Dry Lime Purifiers, Coke Wagons, Fire Tools, Wrought Iron Grate Bars, Gasholders, either Telescopic or Single, with Suspension Frames complete; Wrought Iron Roof Frames, for Iron or Slate; Stop Cocks, Exhausters, Steam Pumps, Boilers and Tanks, Steam or Hand Air Pumps for proving Street Mains, Centre Seals, Governors, Wrought or Cast-Iron, Line Sieves for Purifiers, Hoisting Machines for Lifting Purifier Covers.

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(Successors to Colwell & Co.)

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THE UNDERSIGNED DESIRES TO undertake the supervision of several small Gas-works, to visit and examine them as often as may be necessary; to obtain and inspect their coal, castings, fire-brick, and other materials; and to manage their general business in such a manner that they shall be under such supervision as is now attainable in large works, at much increased cost. Also, to advise as general Consulting Engineer and expert in practical chemistry.

CHAS. M. CRESSON,
Late Asst. Engineer of the Philadelphia Gas-works
417 Walnut st., Philadelphia.

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NEW PATENT

GAS APPARATUS

For Country Residences, Public Buildings, &c.,

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Gas Fitting in all its banches

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SAFETY STEAM PUMP,

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PASSAGE AND FREIGHT AT REDUCED RATES.

Sailing days from New York. 1867.

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And so on at intervals of twenty days, leaving on the Saturday previous, when a regular sailing day comes on Sunday.

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FINKLE & LYON'S

New Family

SEWING MACHINE

Should be known in

IN EVERY TOWN.

To accomplish this at once and save the expense of a *Travelling Agent*, we offer thus, viz:

Any one sending us orders for two machines shall receive one machine free of charge. This proposition cannot avail after we have appointed a local agent in the town.

We have now completed our *new manufacture* at a cost of some $200,000—introducing *new patents*, and such important improvements, that without fear we are able to offer the following stringent guarantee, viz: After a fair trial, if any purchaser does not prefer the FINKLE & LYON FAMILY SEWING MACHINE to any other, he can return it and have back his money.

This machine has taken many of the HIGHEST PRIZES; *is less complicated than any other first class machine; does a wider range of work without changing; requires no taking apart to clean or oil, no "lessons" to set needle, regulate tension or operate machine.*

Our new Manufacturing Machine is sold on the same terms as the Family Machine.

Please send for a circular with samples of sewing.

Finkle & Lyon S. M. Co.
No. 581 BROADWAY, NEW YORK.

Great Improvement

IN

Sewing Machines.

EMPIRE SHUTTLE MACHINE!

Patented February 14th, 1860.

Salsroom, 536 Broadway.

This Machine is constructed on entirely new principles of mechanism, possessing many rare and valuable improvements, having been examined by the most profound experts, and pronounced to be SIMPLICITY and PERFECTION COMBINED.

It has a straight needle, perpendicular action, makes the LOCK or SHUTTLE STITCH, which will NEITHER RIP nor RAVEL, and is alike on both sides; performs perfect sewing on every description of material, from Leather to the finest Nansook Muslin, with cotton, linen, or silk thread, from the coarsest to the finest numbers.

Having neither CAM nor COG WHEEL, and the least possible friction, it runs as smooth as glass, and is

Emphatically a Noiseless Machine!

PRICE OF MACHINES,

COMPLETE:

No. 1, Family Machine, with Hemmer, Feller, Gauge, Braider, & Corder, complete. - - - $60
No. 2 Small Manufacturing, with Extension Table, $75
No. 3. Large Manufacturing, with Extension Table, $85
No 3. Large Manufacturing, for Leather, with Rolling Foot and Oil Cup, 100

One-half hour's instructions is sufficient to enable any person to work this Machine to their entire satisfaction.

Agents Wanted in all Towns in the United States, where Agents are not already established. Also, for Cuba, Mexico, Central and South America, to whom a liberal discount will be given Terms, invariably CASH on delivery.

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GERMAN LAVA GAS-TIPS

And proprietors of Winchester's Improved

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Mercury Cups, Portable Sockets, Burner Pillars, Burner Pliers, &c., &c.

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For Lighting and Heating Purposes.

GAS HEATING AND COOKING APPARATUS; FITTERS' PROVING APPARATUS, &c.

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NEW SYSTEM OF

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BY

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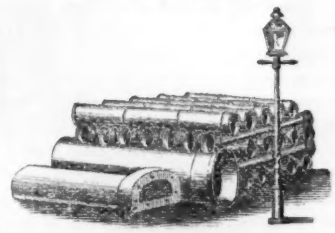
LOUISVILLE PIPE WORKS.

Dennis Long, Proprietor.



Cast Iron Gas and Water Pipe of All Sizes Always on Hand.

Retorts.

STOP-VALVES, AND ALL APPURTENANCES FOR EITHER GAS OR WATER WORKS.

All Pipe, &c., Made of the Very Latest Pattern and Improvements.

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STEAM ENGINES.

Flour and Saw Mill Machinery—Portable Circular Saw Mills, Shafting, Pulleys, &c., &c.

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FOR SAVANNAH, GA.

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SAN SALVADOR,
Commander, Joshua Atkins, and
SAN JACINTO,
Commander, Winslow Loveland.

Every SATURDAY, from pier 13 N. R.

Have been placed on the route to Savannah by the Atlantic Mail Steamship Company of New York, and are intended to be run by them in a manner to meet the first class requirements of the trade. The cabin accommodations of these ships are not excelled by any Steamers on the coast, and although their carrying capacity is large, their draught of water enables them to insure a passage without detention in the river

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San Salvador,	..	"	13
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Returning, leave Savannah every Saturday at 3 o'clock, P. M.

Bills of Lading furnished and signed on the Pier.

For further particulars, engagement of Freight or passage, apply to

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NEW PATENT

Pianos.

RAVEN & BACON.

(Established 1829.)

Warerooms Nos. 644 & 646 Broadway, N Y.

Manufacturers of Piano Fortes, with their Patent Combination Sounding-boards,

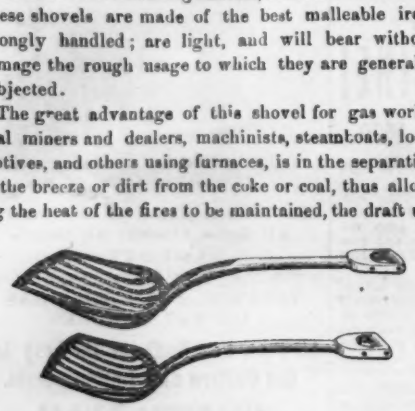
PATENTED AUGUST 14th, 1866.

This invention, introduced exclusively into our Pianos, is of the greatest advantage to the tone of the Instrument, as it affects the sounding-board the very soul of the Piano, and produces thereby a pure liquid tone greatly superior in quality and power to that of the ordinary Piano. The sounding-board released from its connection with the Piano case, and resting upon under sounding-boards, is relieved from the rigidity caused by such connection, and its vibratory quality increased. Our Pianos are first class in every respect, and purchasers will have not only our own guarantee as to their quality, but also the guarantee of the reputation of the instrument, obtained from the experience of our patrons who have used them for a generation. All lovers of this eminently household instrument, as well as parties proposing to purchase new Pianos, are invited to call and examine our assortment. 96-1y

Sabbaton's Patent Screening Shovel.

Every one will see at a glance the excellent features embodied in the screening shovels, illustrated herewith. These shovels are made of the best malleable iron, strongly handled; are light, and will bear without damage the rough usage to which they are generally subjected.

The great advantage of this shovel for gas works, coal miners and dealers, machinists, steamboats, locomotives, and others using furnaces, is in the separation of the breeze or dirt from the coke or coal, thus allowing the heat of the fires to be maintained, the draft un-



obstructed, and clinker avoided; thereby obtaining more heat, as well as saving of labor and cost of repairs.

This shovel was originally invented and patented by the well known gas engineer, Mr. Paul A. Sabbaton, which is a sufficient guarantee of the merit of the improvement.

For further particulars address Mr. A. T. Smithe, sole agent, 126 Maiden Lane, N. Y.

Miscellanea.

—Henry Derringer, the inventor of the pistol which bears his name, died recently in Philadelphia, aged 81 years.

—A condenser is reported as having been purchased by Colonel Merewether, of the British Army, for Anneeley Bay, on the Red Sea, capable of condensing six thousand gallons a day.

—The bridge now being built by the Union Pacific Railroad Company over Dale Creek, west of Cheyenne, is nearly 2,000 feet long, and over 110 feet high.

—Pouillet has made observations with a pyrheliometer from which he estimates that the amount of heat annually received by the earth from the sun would melt a crust of ice surrounding the earth 101 ft. thick.

—Smoke from gaslights is not usually occasioned by any impurity in the gas, but the evil arises either from the flame being raised so high that some of its forked points give out smoke, or more frequently from a careless mode in lighting. When we suddenly open the stop cock, and allow a stream of gas to escape before applying the match, a strong puff follows the lighting and a cloud of black smoke rises to the ceiling. Daily repetition gives in time a blackened wall.

—One of the latest Parisian novelties is a scarf-pin for gentlemen's wear in which a curious application of electricity is introduced. The pins are finished with imitation human heads, the eyes of which are made to open or shut at the will of the owner. The electro-motor is a simple voltaic element of zinc and carbon, or zinc and platinum, the whole being inclosed in a small brass case conveniently carried in the vest pocket. The carbon is fixed in a vessel partly filled with a solution of sulphate of mercury, and the zinc is attached to the lid of the case No electrical action is generated so long as the case is carried perpendicularly, but if laid on its side a current is formed.

—The New Orleans Gas Company seems likely to have formidable competition in the natural gas which has been discovered in that region. This gas has been obtained in several places by sinking a hollow iron shaft to a depth of forty feet. When thus procured it flows steadily at the rate of five feet per hour, and is accumulated in tanks. It burns with a clear white flame, equal, it is said, to that of the best purified coal gas. It is not difficult to account for this phenomenon on scientific principles, but it is questionable whether he supply of gas from such sources can be relied on.

PATENT CLAIMS.

Pertaining to Gas, Mining, Petroleum, Water, etc.

75,765.—Water Wheel.—Jacob O. Joyce, Dayton, O.

I claim the annular concave plates 1, 2 and 3, having the buckets *k l* arranged between them so that the upper ones *k* will alternate in position with the lower ones *l*, the plates and backets gradually diminishing in depth from the top downwards, so as to give the wheel a cylindrical exterior and a conical interior, all constructed as described, and arranged in connection with the register-case E and gate or chute-cylinder H, substantially as specified.

75,819.—Pump.—Stillman White, assignor to himself and Christopher Dexter, East Providence, R. I.

I claim a pumping-apparatus, consisting of a central force-pump and two or more lift or suction pumps, the area of the first being quite equal to the area of both or all the others, and so arranged that power applied to the main or central piston-rod is communicated by means of a cross-head to both or all the other piston-rods so that the power of forcing the main or central piston downward is fully compensated or balanced in its ascent, substantially as shown and described.

75 960 Lamp Burner.—Geo. Neilson, Boston, Mass.

I claim, 1. The combination, in a burner such as described, of the air-supply cylinder, with a deflector hinged to said cylinder, substantially as and for the purpose herein shown and set forth.

2. The combination, with the chimney-rest and wick-tube, of an air-supply cylinder, detachable or removable from its seat, and a deflector hinged to the air-supply cylinder, substantially as and for the purposes herein shown and set forth.

3. The combination, in a burner such as described, of a chimney rest, air-supply cylinder, and deflector, when the said parts are capable of being removed from and adjusted to the burner bodily and together, substantially as and for the purpose herein shown and specified.

4. The combination, with the base and wick-tube of a lamp burner, of a chimney-rest, air-supply cylinder, and deflector when the same are detachable from the said base and wick-tube, and from one another, substantially in the manner and for the purpose shown and described.

5. The combination, with the air-supply cylinder, of chimney-supporting springs, attached to and projecting from said cylinder, substantially as herein shown and described.

75,653.—Gas Meter.—A. W. Smith, Birmingham, Pa.

I claim, 1. The construction of the wet gas meter, with the reservoir E, the passages, G G G G, the double stopcock H, with the bores I I', and the cap J, all arranged for the purpose and in the manner substantially as set forth and described.

2. The manner of constructing the condensing-well A, the passage B, and the cap C, all arranged for the purpose substantially as set forth and described.

3. The filler K, constructed with the double stopcock L, with the bores N N', the extension tube O, the swivel M, the screw tube and plug F, and the handle Q, all arranged and operating in the manner and for the purpose substantially as set forth and described.

Advertising Index.

☞ In looking for advertisements, see figures 1 to 9, within brackets, at head of advertisement pages.

GAS-BURNERS, APPARATUS, ETC.

Arnold's Metallic Gas Trays—T. G. Arnold, 334 and 336 West 21st street, N. Y. 1
American Meter Company, 512 West 22d street, New York 8
Automatic Gas Purifier—State Rights for sale—Wm. C. Turnbull, care of T. C. Babcock, 59 Broadway, or office of the American Gas-Light Journal 2
Builder of Gas Works, Apparatus, Etc.—P. P. Delly, 39 Laurel street, Philadelphia 1
Contractors for Gas-works, Etc.—Murray, Baker & Walker, Fort Wayne, Ind 3
Gasoleine,—J. W. Wheelock, 284 Pearl st., New York 4
Gas Coals—Bird, Perkins & Job, 104 Wall street, New York 4
Gas Engineers and Contractors—Hoy, Kennedy & Co., 111 Liberty street, New York 4
Gas-Burners—C. Gefrorer, 529 Commerce street, Philadelphia, Pa 9
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street, Philadelphia, Pa 8
Gas Superintendent—C. M. Cresson, 417 Walnut st., Phil., Pa. 9
Gas Apparatus, &c.—Geo. H. Kitchen & Co., 561 Broadway 9
Gas Burners—Wightman Bros., 25 Kilby st., Boston, Mass. 9
Gas Burners—T. G. Arnold, 224 and 226 West 21st st., N. Y. 9
Gas Burners—W. Anderson, cor Franklin & Elm sts., N. Y. 1
Gas Works for Sale—Colonel J. A. Sabbaton, Manhattan Gas Works, N. Y. 1
Gas Stoves—A. L. Bogart, 792 Broadway 7
Gas Fixtures, Meters, Etc., Etc.,—McHenry & Carson, Cincinnati, Ohio 1
Gas Fixtures & Chandeliers—Alfred Bliss & Co., 95 Bleecker-st., New York 8
Haskins' Gas Stoves—Ford & Murray, 29 East 13th street 1
Metropolitan Gas Stove Co., 704 Broadway, New York 2
Plumbers, Gas and Steam Fitters—Moore & Gaessen, 221 West Fifth street, Cincinnati, O. 6
Patent Gas Exhauster—Smith & Sayre, 434 Broadway 5
Purifying Trays—Jno. L Cheeseman, 147 and 149 Ave. C, N.Y. 1
Robbins' Patent Joint for Gas and Water Pipes 4
Solar Gas Machines—Smith & Drake, 726 Broadway 2

FOUNDRIES.

Brooklyn Tube Works—B. T Benton, Brooklyn 7
Bergen Iron Works—Driving Pipes and Bands—R. A. Brick, 109 Leonard street, N. Y. 7
Columbian Iron Works—Wm. Taylor & Sons, 11, 13 and 15 Cast Iron Pipes and Fittings—B. S. Benson, 52 East Monument street, Baltimore, Md. 4
Adams street, Brooklyn, N. Y. 6
Dealers in Iron, Copper, Brass, etc.—T. Cassidy & Co., corner of Bridge and John streets, Brooklyn, N. Y. 4
Erie Basin Iron Works—Elizabeth, Dwight and Van Dyke sts., South Brooklyn, N. Y. 2, 6
Gaylord's Great Western Pipe Foundry—Office 90 and 92 Broadway, Cincinnati, Ohio 8
Louisville Pipe Works—Dennis Long, Cor. 9th and Water-sts., Louisville, Ky. 9
Manufacturing Enamelers—Nessle & Taylor, 97 Water street, Brooklyn, N. Y. 4
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman and Wilkins streets, Pittsburgh, Pa. 7
Oregon Iron Foundry—Herring & Floyd, 738, 740, 742 and 744 Greenwich street, New York 6
Pascal Iron Works—Morris, Taskar & Co., Philadelphia, Pa. 9
Southwark Foundry—Merrick & Sons, Fifth and Washington streets, Philadelphia 9
Wrought Iron Pipes, etc.—Joseph Nason & Co., 61 Beekman street, New York 4

WATER METERS, PUMPS, ETC.

Aubin Water Meter—H. Q. Hawley, Albany, N. Y. 6, 9
Babcock & Wilcox's Stationary Steam Engines 1
Davis' Steam Superheating Boiler—Duplex Steam Boiler Mf'g Company, Long Island City, N. Y. 9
Gaylord's Patent Couplings—Gaylord Patent Coupling Co., 31 and 33 Dey street, N. Y. 7
Pat. Lead-Encased Tin Pipes—Colwells, Shaw & Willard, foot of West 27th street, N. Y. 6
Patent Dry Centre Valve—American Meter Company, 512 West 22d street New York 5
Steam Pumps—H. R. Worthington, 61 Beekman st. New York 6
Water Pipes, etc.—S. Fulton & Co. 207 North Water st Phila. 9
Water Closets, etc.—Wm. S. Carr & Co. 149, 151, 153, 155, 157 Centre street, New York 4
Water and Sewerage Pipes—Am. Water and Gas Pipe Company northwest corner of Green and Bay sts., Jersey City, N. J. 5
Worthington's Water Meters—H. R. Worthington, 61 Beekman street, New York 2
Woodward Steam Pump Mf'g Co. 76, 78 Centre st. New York 9

CLAY RETORT WORKS.

Bay State Clay Retort Works, 125, 127 Water st. Boston, Mass. 6
Brooklyn Clay Retort Works, Van Dyke st. Brooklyn, N. Y. 5
Clay Retorts, Tiles, etc.—J. H. Gautier & Co. Jersey City, N. J. 5
Laciede Fire Brick Works, 1007 North Levee, St. Louis, Mo. 6
Mannattan Clay Retort Works, 15th st. near Av. C, New York 5
New York " " 56 Goerck street, New York 5
Philadelphia Fire Brick Works, Vine and 23d sts. Philadelphia. 5
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Sodium Amalgam &c.—Prof. Wurtz, 26 Pine st., New York 5
School of Mines, Columbia College, East 49th st. " 2

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Street Lamps—J. G. Miner, Morrisania, Westchester Co., N.Y. 3

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Empire Shuttle Machine—T. J. McArthur, 536 Broadway 9
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Finkle & Lyon Sewing Machine Company, 581 Broadway 9
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Gas Works Apparatus For Sale—Elizabeth (N. J.) Gas Co 1
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Roofing Materials—E. Van Orden & Co. 41 Liberty st. 4
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Second-Hand Purifiers Wanted—Apply at office of this paper. 6
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